1 The probability that a spinner will land on blue is 0.4

Rayyan is going to spin the spinner 280 times.
Work out an estimate for the number of times the spinner will land on blue.

0.4×280 (1)

$= 112$ times (1)

112

(Total for Question 1 is 2 marks)

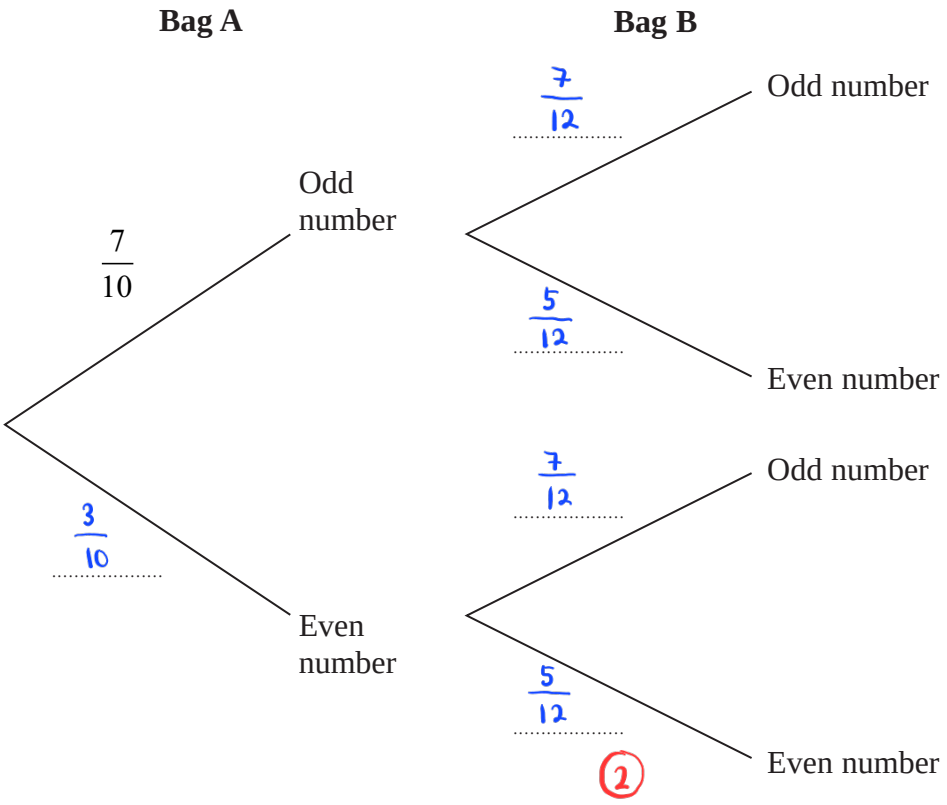
2 Cody has two bags of counters, bag **A** and bag **B**.

Each of the counters has either an odd number or an even number written on it.

There are 10 counters in bag **A** and 7 of these counters have an **odd** number written on them.
There are 12 counters in bag **B** and 7 of these counters have an **odd** number written on them.

Cody is going to take at random a counter from bag **A** and a counter from bag **B**.

(a) Complete the probability tree diagram.



(2)

(b) Calculate the probability that the total of the numbers on the two counters will be an odd number.

To get a total of odd numbers,

① odd + even

② even + odd

① $\frac{7}{10} \times \frac{5}{12} = \frac{7}{24}$ ①

② $\frac{3}{10} \times \frac{7}{12} = \frac{7}{40}$

Total $= \frac{7}{24} + \frac{7}{40}$ ①

$= \frac{56}{120}$ ①

$\frac{56}{120}$

(3)

Harriet also has a bag of counters.
Each of her counters also has either an odd number or an even number written on it.

Harriet is going to take at random a counter from her bag of counters.

The probability that the number on each of Cody's two counters **and** the number on Harriet's counter will all be even is $\frac{3}{100}$

(c) Find the least number of counters that Harriet has in her bag.
Show your working clearly.

Let Harriet's even counter = E

Let Harriet's odd counter = D

P(all even) $= \frac{3}{10} \times \frac{5}{12} \times \frac{E}{E+D} = \frac{3}{100}$ ①

$\frac{E}{E+D} = \frac{0.03}{0.125}$

$\frac{E}{E+D} = 0.24$ ①

$E = 0.24E + 0.24D$

$0.76E = 0.24D$

$E = \frac{6}{19}D$ → 6 E and 19 D

25

∴ Least number of counter is 6 + 19 = 25 ①

(3)

(Total for Question 2 is 8 marks)

3 A bag contains only red beads, blue beads, green beads and yellow beads.

The table gives the probabilities that, when a bead is taken at random from the bag, the bead will be blue or the bead will be yellow.

Colour	**red**	**blue**	**green**	**yellow**
Probability	0.15	0.24	0.30	0.31

The probability that the bead will be green is twice the probability that the bead will be red.

Sofia takes at random a bead from the bag.
She writes down the colour of the bead and puts the bead back into the bag.

She does this 180 times.

Work out an estimate for the number of times she takes a red bead from the bag.

Probability of red or green bead is taken :

$1 - 0.31 - 0.24 = 0.45$ (1)

Given : $P(G) = 2P(R)$

$P(G) + P(R) = 0.45$

$2P(R) + P(R) = 0.45$

$3P(R) = 0.45$

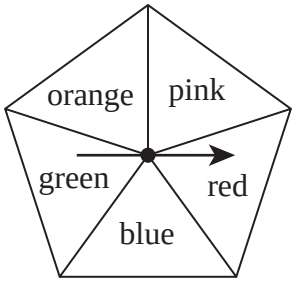
$P(R) = \frac{0.45}{3} = 0.15$ (1)

$\therefore 0.15 \times 180 = 27$ (1)
(1)

27

(Total for Question 3 is 4 marks)

4 Grace has a biased 5-sided spinner.



Grace is going to spin the arrow on the spinner once.

The table below gives the probabilities that the spinner will land on red or on blue or on green.

Colour	Red	Blue	Green	Orange	Pink
Probability	0.20	0.12	0.08	0.45	0.15

The probability that the spinner will land on orange is 3 times the probability that the spinner will land on pink.

(a) Work out the probability that the spinner will land on orange.

Probability of the spinner landing on orange or pink :

$1 - 0.20 - 0.12 - 0.08$

$= 0.60$ (1)

$P(O) = 3P(p)$

$\frac{3}{4}(0.60) = 0.45$ (1) (1)

0.45

(3)

Grace spins the arrow on the spinner 150 times.

(b) Work out an estimate for the number of times the spinner lands on blue.

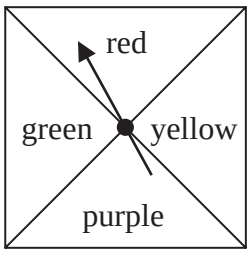
$0.12 \times 150 = 18$ (1) (1)

18

(2)

(Total for Question 4 is 5 marks)

5 Here is a biased spinner.



When the spinner is spun once, the probabilities that it lands on red or on yellow or on green are given in the table.

Colour	red	yellow	purple	green
Probability	0.25	0.2	0.35	0.2

(a) Work out the probability that the spinner lands on red or on yellow.

$P(R) + P(Y) = 0.25 + 0.2$

$= 0.45$ (1)

0.45

(1)

Yang is going to spin the spinner 300 times.

(b) Work out an estimate for the number of times the spinner will land on purple.

$1 - (0.25 + 0.2 + 0.2)$ (1)

$= 0.35$

$0.35 \times 300 = 105$ (1) (1)

105

(3)

(Total for Question 5 is 4 marks)

6 Ciara throws **four** fair six-sided dice.

The faces of each dice are labelled with the numbers 1, 2, 3, 4, 5, 6

Work out the probability that at least one of the dice lands on an even number.

Probability of a dice to land on even numbers:

$$\frac{3}{6} = \frac{1}{2}$$

Probability of a dice to land on odd numbers:

$$\frac{3}{6} = \frac{1}{2}$$

Tips:

① Find probability of all four dices to land on odd numbers.

② 1 minus probability in ① to get the probability of at least one dice lands on an even number.

P(all four lands on odd numbers):

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16}$$ ①

P(at least one of the dice lands on even numbers):

$$1 - \frac{1}{16} = \frac{15}{16}$$ ①

①

$\frac{15}{16}$

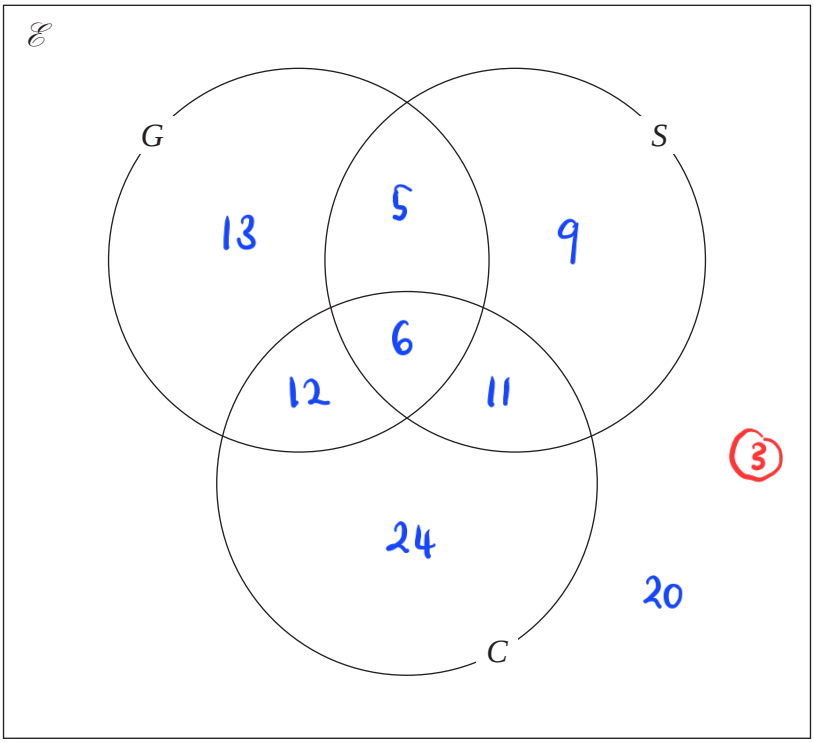
.....

(Total for Question 6 is 3 marks)

7 100 farmers are asked if they have goats (G), sheep (S) or chickens (C) on their farms.

Of these farmers
- 31 have sheep
- 53 have chickens
- 6 have goats, sheep and chickens
- 11 have sheep and goats
- 17 have sheep and chickens
- 18 have goats and chickens
- 20 do not have any goats, sheep or chickens

(a) Using this information, complete the Venn diagram to show the number of farmers in each appropriate subset.



(3)

(b) Find

(i) n(G)

$13+12+5+6 = 36$

36 (1)

(1)

(ii) n($[G \cup S]'$)

$24+20 = 44$

44 (1)

(1)

(iii) n($G' \cap C$)

$24+11 = 35$

35 (1)

(1)

One of the farmers who has chickens is chosen at random.

(c) Find the probability that this farmer also has goats.

$$\frac{12+6}{24+12+6+11} = \frac{18}{53}$$

$\frac{18}{53}$ (2)

(2)

(Total for Question 7 is 8 marks)

8 Each time John plays a game, the probability that he wins the game is 0.65

John is going to play the game 300 times.

Work out an estimate for the number of games that John wins.

$0.65 \times 300 = 195$ (1) (1)

195

(Total for Question 8 is 2 marks)

9 A tin contains tea bags with a choice of four different flavours of tea.
The four flavours of tea are Assam or Darjeeling or Nilgiri or Rize.

Sara takes at random a tea bag from the tin.

The table shows each of the probabilities that the flavour of the tea Sara takes is Assam or Darjeeling or Rize.

Flavour of tea	Assam	Darjeeling	Nilgiri	Rize
Probability	0.38	0.24	0.22	0.16

(a) Work out the probability that the flavour of the tea Sara takes is Nilgiri.

$1 - (0.38 + 0.24 + 0.16)$ (1)

$= 0.22$ (1)

0.22

(2)

(b) Work out the probability that the flavour of the tea Sara takes is either Darjeeling or Rize.

$0.24 + 0.16 = 0.4$
(1) (1)

0.4

(2)

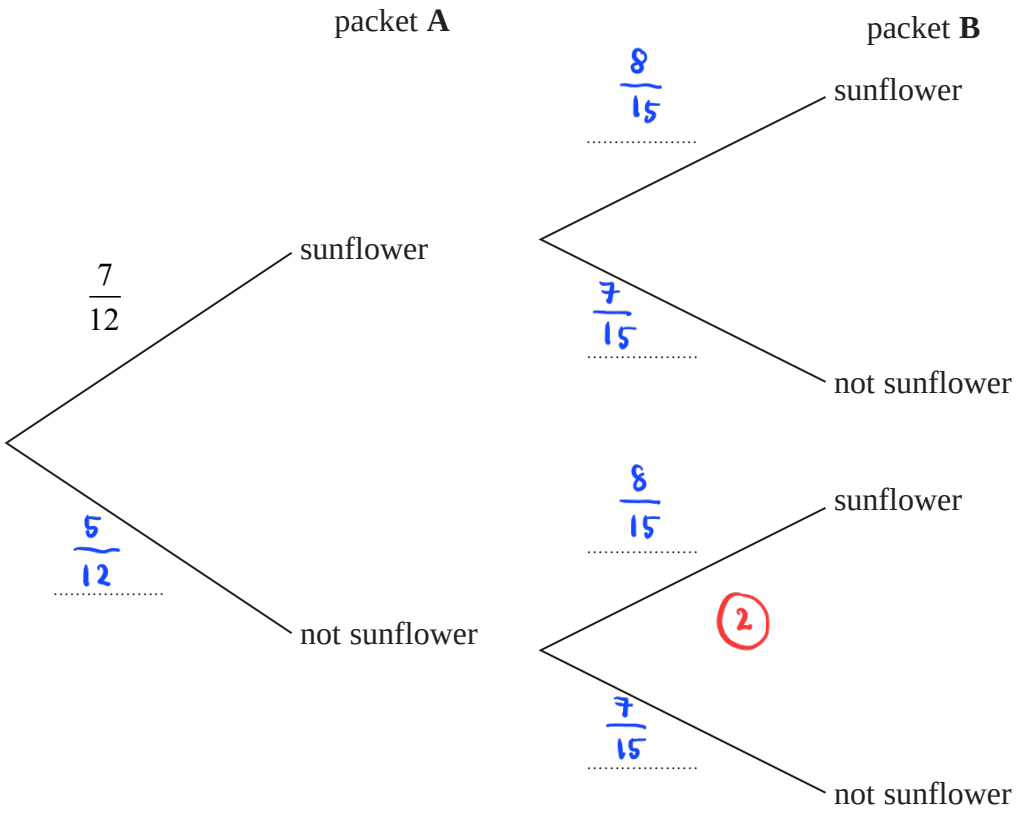
(Total for Question 9 is 4 marks)

10 Aika has 2 packets of seeds, packet **A** and packet **B**

There are 12 seeds in packet **A** and 7 of these are sunflower seeds.
There are 15 seeds in packet **B** and 8 of these are sunflower seeds.

Aika is going to take at random a seed from packet **A** and a seed from packet **B**

(a) Complete the probability tree diagram.



(2)

(b) Calculate the probability that Aika will take two sunflower seeds.

$\frac{7}{12} \times \frac{8}{15} = \frac{14}{45}$ (1)

(1)

$\frac{14}{45}$

(2)

(Total for Question 10 is 4 marks)

11 A bag contains only pink sweets, white sweets, green sweets and red sweets.

The table gives each of the probabilities that, when a sweet is taken at random from the bag, the sweet will be green or the sweet will be red.

Sweet	pink	white	green	red
Probability	0.3	0.15	0.2	0.35

The ratio

number of pink sweets : number of white sweets = 2 : 1

There are 28 red sweets in the bag.

Work out the number of white sweets in the bag.

$1 - 0.2 - 0.35 = 0.45$ (1)

pink : $\frac{2}{3} \times 0.45 = 0.3$

white : $\frac{1}{3} \times 0.45 = 0.15$ (1)

$\frac{28}{0.35} = 80$ (1)

$0.15 \times 80 = 12$ (1)

(1)

12

.....

(Total for Question 11 is 5 marks)

12 The table gives information about the time taken by each student in Year 11 to complete a homework task.

Time taken (t minutes)	Frequency
$10 < t \leqslant 25$	15
$25 < t \leqslant 30$	18
$30 < t \leqslant 50$	32
$50 < t \leqslant 60$	4

$15 \div 15 = 1$

$18 \div 5 = 3.6$

$32 \div 20 = 1.6$

$4 \div 10 = 0.4$

One of these students who took 50 minutes or less and more than 25 minutes to complete this homework task is chosen at random.

(b) Find an estimate for the probability that this student took 45 minutes or less to complete this homework task.

$25 < x < 50 = 18 + 32 = 50$ students

$(45 - 30) \times 1.6 = 24$ (1)

$\frac{24 + 18}{50} = \frac{42}{50}$ (1)

$\frac{42}{50}$

.....

(2)

(Total for Question 12 is 2 marks)

13 Some members of a library were asked to name the type of book that they each liked to read the best.

One of the members is chosen at random.
The table shows information about the probability of the type of book that this member answered.

Type of book	comedy	romance	mystery	thriller
Probability	0.24	0.40	$3x$	x

48 members answered comedy books.

Work out how many of the members answered mystery books.

$1 - 0.24 - 0.40 = 0.36$ (1)

$4x = 0.36$

$x = 0.09$ (1)

$\frac{48}{0.24} = 200$

$3(0.09) \times 200$

0.27×200 (1)

$= 54$ (1)

54

(Total for Question 13 is 4 marks)

14 Here are 9 cards. Each card has either a number on it or a letter on it.

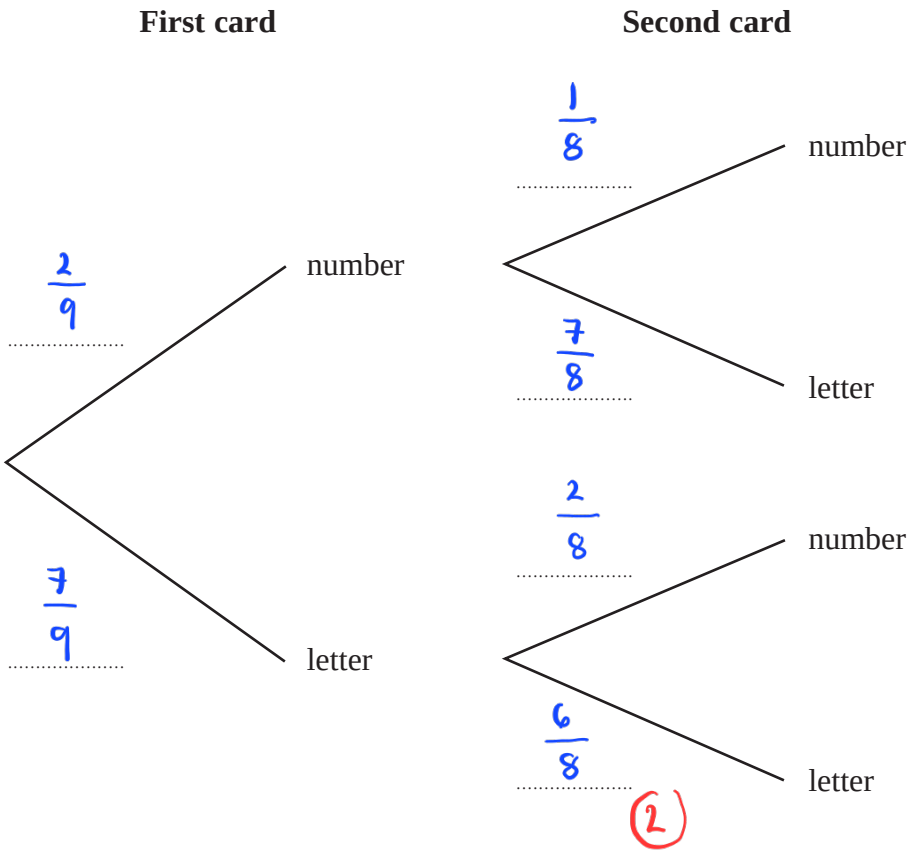
A	7	H	F	E	D	G	5	C

Tomas is playing a game.

Tomas takes at random one of the cards and keeps it.

Tomas then takes at random another card and keeps it.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that each of the two cards has a number on it.

$\frac{2}{9} \times \frac{1}{8} = \frac{2}{72} = \frac{1}{36}$ (1) (1)

$\frac{1}{36}$

(2)

(c) Work out the probability that there will be one card with a number on it and one card with a letter on it.

$\frac{\cancel{2}^{1}}{9} \times \frac{7}{\cancel{8}_{4}} + \frac{7}{9} \times \frac{2}{8}$ (1)

$\frac{7}{36} + \frac{14}{72}$ (1)

$\frac{7}{36} + \frac{7}{36} = \frac{14}{36} = \frac{7}{18}$ (1)

$\frac{7}{18}$

(3)

(Total for Question 14 is 7 marks)

15 The table gives information about the weights, in kg, of the parcels that Pedro delivers on Monday.

Weight (w kg)	Frequency
$0 < w \leqslant 2$	12
$2 < w \leqslant 3$	7
$3 < w \leqslant 6$	15
$6 < w \leqslant 9$	12
$9 < w \leqslant 14$	9

FD
12/2 = 6
7/1 = 7
15/3 = 5
12/3 = 4
9/5 = 1.8
(1)

One of the parcels that Pedro delivered on Monday is chosen at random.

(b) Using the information in the table, find an estimate for the probability that this parcel weighs more than 7 kg.

Total : 12 + 7 + 15 + 12 + 9
= 55

2/3 × 12 + 9 (1)
= 8 + 9 = 17

17/55 (1)

17/55

(2)

(Total for Question 15 is 2 marks)

16 Each time Evie plays a game against her computer, she will win or lose.

For each game, the probability that Evie will win is 0.74
Evie is going to play 300 games against her computer.

Work out an estimate for the number of games that Evie will lose.

Probability losing = $1 - 0.74 = 0.26$ (1)

$0.26 \times 300 = 78$ (1)

78

(Total for Question 16 is 2 marks)

17 30 adults booked to stay in a hotel.

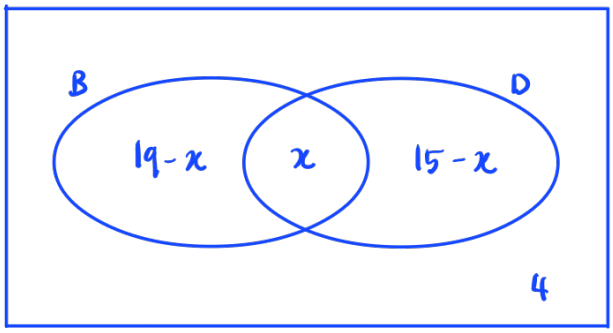
19 adults booked breakfast
15 adults booked dinner
4 adults did not book breakfast or dinner

Some adults booked breakfast **and** dinner.

Meihui chooses at random two of the 30 adults.

Work out the probability that these two adults each booked breakfast **and** dinner.

x = breakfast and dinner



(1)

$19 - x + x + 15 - x + 4 = 30$

$38 - x = 30$

$x = 8$ (1)

$\frac{8}{30} \times \frac{7}{29} = \frac{56 \div 2}{870 \div 2} = \frac{28}{435}$ (1)

(1)

$\frac{28}{435}$

(Total for Question 17 is 4 marks)

18 A biased spinner can land on green or on yellow or on brown or on pink.

The table gives the probabilities that, when the spinner is spun, it will land on green or on yellow or on brown.

Colour	**green**	**yellow**	**brown**	**pink**
Probability	0.32	0.13	0.28	

Timucin spins the spinner 200 times.

Work out an estimate for the number of times the spinner lands on pink.

P(pink) = 1 − 0.32 − 0.13 − 0.28

= 0.27 (1)

0.27 × 200 = 54 (1) (1)

54

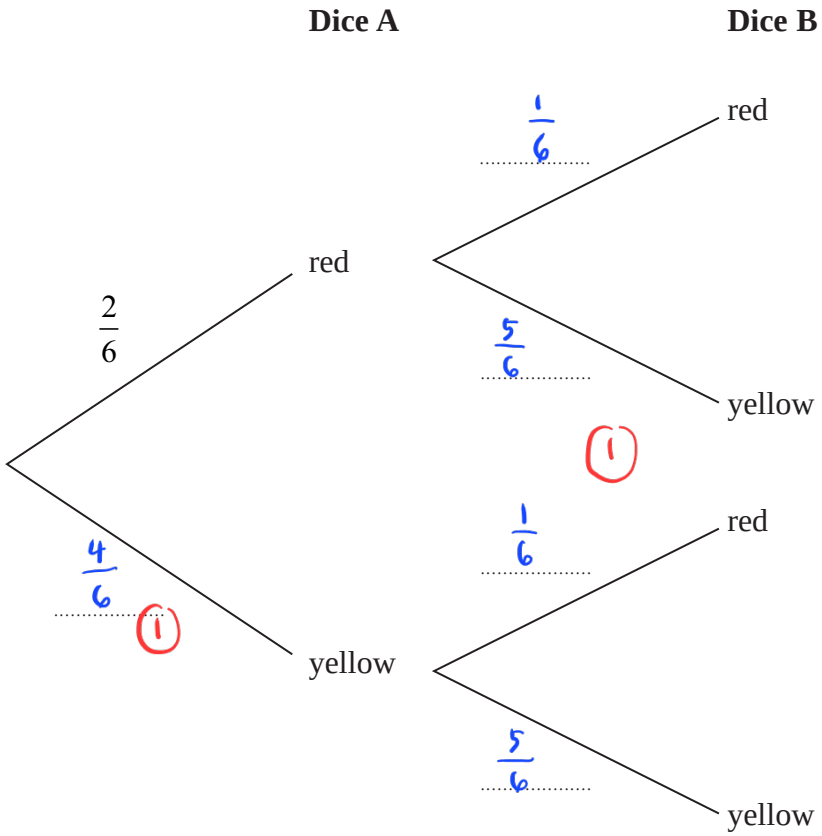
(Total for Question 18 is 3 marks)

19 Narin has two fair 6-sided dice.

Dice **A** has 2 red faces and 4 yellow faces.
Dice **B** has 1 red face and 5 yellow faces.

Narin is going to throw each dice once.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that both dice land on yellow.

$\frac{4}{6} \times \frac{5}{6} = \frac{20}{36} = \frac{5}{9}$

$\frac{5}{9}$

(2)

(Total for Question 19 is 4 marks)